

REMARKS

Claims 1-18 have been rejected under 35 U.S.C. §103, as unpatentable over combinations of references which include at least Venkatesan and Seidle.

Claims 19 and 20 have been rejected over combinations of references which do not include Seidle, apparently because these claims did not recite the non-cryogenic production of an oxygen-enriched gas at the surface of an oil-bearing formation.

Claim 19 has therefore been amended to recite that the step of generating an oxygen-enriched gas above the surface of the formation is performed non-cryogenically.

It is believed that Claims 1-20 now present the same central issue, which will be discussed below.

The present invention resides in the concept of using an oxygen-enriched gas, generated non-cryogenically above the surface of an oil-bearing formation, in an enhanced oil recovery process. The oxygen-enriched gas is injected into the formation, where it promotes combustion of a portion of the hydrocarbons in the formation, thereby reducing the viscosity of oil in the formation, and facilitating the extraction of such oil.

This inventive concept, as is now recited in all of the pending claims, has not been taught or suggested by any of the known prior art.

The Examiner has held that the above-described concept is not patentable in view of the patents to Venkatesan and Seidle. Applicants

submit that this combination is not warranted under Section 103, for the following reasons.

First, the Examiner concedes that Venkatesan does not teach a method for generating an oxygen-enriched gas stream. At most, Venkatesan teaches the injection of oxygen into an oil well, but the patent gives no hint about where the oxygen originates. For Venkatesan's purposes, the oxygen could be produced cryogenically, and/or it could be produced far from the well, and transported to the well site in compressed-gas cylinders.

To supply what is clearly missing in Venkatesan, the Examiner cites Seidle, which describes, in detail, two non-cryogenic methods for producing an oxygen-enriched gas stream, namely membrane separation and pressure swing adsorption.

The patent to Seidle devotes considerable space to a description of many uses for a non-cryogenically generated oxygen-enriched gas stream. Conspicuously absent is any suggestion of the present claimed use.

The description of the various uses of an oxygen-enriched gas stream, in Seidle, extends from column 15 through column 17. Such uses are summarized as follows (with citations to the Seidle patent):

- a) an oxygen-enriched gas stream may be combined with a stream of nitrogen and methane, withdrawn from a well, to produce heat or electric power (column 15, lines 17ff);

- b) an oxygen-enriched gas stream may be used in non-combustive chemical reactions, such as oxidative coupling of methane to higher molecular weight hydrocarbons (column 15, lines 47ff);

- c) an oxygen-enriched gas stream may be used in "a variety of other chemical and petrochemical processes requiring a source of oxygen" (column 16, lines 35ff), such as steel manufacturing (column 16, lines 47ff), production of non-ferrous metals (lines 51ff), chemical oxidation

processes, such as catalytic oxidation of ethylene to ethylene oxide or ethylene glycol (lines 55ff), the production of synthesis gas, which can be converted to methanol, acetic acid, or dimethyl ether (lines 60ff), and in a Claus process, for the removal of hydrogen sulfide from natural gas (column 17, lines 6ff).

Notwithstanding the lengthy and detailed listing of the uses for an oxygen-enriched stream, which is apparently produced above the surface of a well, the patent to Seidle fails to mention the possibility that the oxygen-enriched stream could be injected into a well to enhance the recovery of oil.

The context of the patent to Seidle clearly suggests that Seidle was trying to list all possible uses of the oxygen-enriched stream. The failure of the patent to list the use proposed by the present invention shows that the present invention is not obvious.

It is apparent that, until the making of the present invention, no one had thought of using non-cryogenically produced oxygen-enriched gas in an enhanced oil recovery process. If such a concept were "obvious", Seidle would have listed this use, among the many other uses of an oxygen-enriched gas stream.

The patent to Seidle clearly exemplifies the level of skill of the person of ordinary skill, in the time period of the 1990s. Clearly, the idea of using non-cryogenically produced oxygen-enriched gas for enhanced oil recovery was not within this level of skill. Insofar as the Seidle patent conspicuously omits the use of the oxygen-enriched stream claimed in the present application, the patent itself provides the most significant evidence that the present invention is not obvious.

Applicants therefore submit that, in view of the lengthy listing of

uses of an oxygen-enriched stream, by Seidle, and the failure of Seidle to mention the present claimed use, the present invention is not obvious, and is patentable over the combination of Venkatesan and Seidle.

The remaining references, cited by the Examiner, do not relate to the issues discussed above, and do not supply what is missing in Seidle.

Therefore, Applicants submit that all of the pending claims are allowable over the references.

Applicants request reconsideration, and early favorable action, by the Examiner.